If we don't approve Yucca Mt., then what do we do with the wastes?:

"H.O.S.S." it:

"Hardened On-Site Storage"

IEER NUCLEAR WASTE MANAGEMENT PLAN

June 4, 2002

[*NOTE: It has been pointed out that even if no more "high-level" radioactive wastes (HLRW) were produced, we would still have to do something with the wastes we have, until such time as a final repository were opened. It's also obvious since 9/11 that the current safety and security practices employed to manage HLRW at reactors are inadequate and unacceptable. "What is the alternative?", environmentalists are asked.*

Alternatives exist -- "HOSS" is one. Many feel it's better to be deliberate and not err, than implement an obviously flawed plan just to say "we had to do 'something.'" With HLRW, if we do "something," it must be the "right" thing, because we won't get a second chance to be wrong.]

IEER advocates the following program be carried out by an institution that does not have the conflict of interest that the U.S. Department of Energy (DOE) does, and under more stringent public health and environmental protection standards than those currently in effect:

Interim Management

Interim Hardened On-Site Storage (HOSS) (different from spent fuel pools and dry casks now used) should be used for all spent fuel that can be moved out of pools. Pool storage should be minimized. No new above-ground dry storage of the present varieties should be licensed. Current dry storage should be converted to HOSS. The federal government should pay for HOSS at closed power plant sites since it has defaulted on its obligation to begin taking the waste on January 31, 1998, and has large amounts of ratepayer money dedicated to waste management that it has not spent.

Goals: Hardened On-Site Storage should be able to withstand most terrorist attacks without significant off-site releases. A second level goal is to prevent catastrophic off-site releases in case of even severe attacks. There could be defense in depth as part of the system.

The technology to accomplish HOSS is available.

Interim Hardened On-Site Storage (HOSS) should meet the following criteria:

1. It should not result in catastrophic releases, and resist almost all types of attacks. The amount of release projected in even severe attacks should be small enough that the storage system would be unattractive as a terrorist target.

2. It should be able to withstand a direct hit by a large commercial airliner full of fuel or anti-tank weapons without catastrophic offsite releases.

3. The individual canister locations should not be easily detectable from offsite.

On-site storage would be needed for ~50 to 60 years -- not much different from what is projected to occur at present.

Long-term Management

The long-term repository plan should proceed as follows:

Ten years of the following scientific and engineering work:

1. Research on natural geologic conditions that retard the movement of radionuclides for long periods.
2. Development of materials that mimic these natural geologic conditions ("Natural analog" materials).
3. Research on geologic environment types that would match the characteristics of these natural analogs.
4. Intensified basic scientific research on the properties of the most important radionuclides under a variety of laboratory conditions.

After this initial work, the process of selecting 2 or 3 repository and natural analog types would be initiated for concentrated work (10 yrs.). Then site selection (10 yrs.).

If the process is sound,disposal could in principle happen in the twenty years to follow. The total time for complete disposal of fuel from existing power plants (40 year license) would be roughly 50 years, maybe 60. If the power plants are closed down the overall timetable would not be longer than envisioned for Yucca Mountain now.

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Principles for Safeguarding Nuclear Waste at Reactors

The following principles are based on the urgent need to protect the public from the threats posed by the current vulnerable storage of commercial irradiated fuel. The United States does not currently have a national policy for the permanent storage of high-level nuclear waste. The Obama administration has determined that the Yucca Mountain site, which has been mired in bad science and mismanagement, is not an option for geologic storage of nuclear waste. Unfortunately, reprocessing proponents have used this opportunity to promote reprocessing as the solution for managing our nuclear waste. Contrary to their claims, however, reprocessing is extremely expensive, highly polluting, and a proliferation threat, and will actually complicate the management of irradiated fuel. Nor will reprocessing obviate the need for, or "save space" in, a geologic repository.

The United States has a unique opportunity to re-evaluate our nuclear waste management plan. We can make wise decisions about safeguarding radioactive waste or go down the risky, costly, and proliferation prone path towards reprocessing.

The undersigned organizations' support for improving the protection of radioactive waste stored at reactor sites is a matter of security and is in no way an indication that we support nuclear power and the generation of more nuclear waste.

- **Require a low-density, open-frame layout for fuel pools:** Fuel pools were originally designed for temporary storage of a limited number of irradiated fuel assemblies in a low density, open frame configuration. As the amount of waste generated has increased beyond the designed capacity, the pools have been reorganized so that the concentration of fuel in the pools is nearly the same as that in operating reactor cores. If water is lost from a densely packed pool as the result of an attack or an accident, cooling by ambient air would likely be insufficient to prevent a fire, resulting in the release of large quantities of radioactivity to the environment. A low density, open-frame arrangement within fuel pools could allow enough air circulation to keep the fuel from catching fire. In order to achieve and maintain this arrangement within the pools, irradiated fuel must be transferred from the pools to dry storage within five years of being discharged from the reactor.

- **Establish hardened on-site storage (HOSS):** Irradiated fuel must be stored as safely as possible as close to the site of generation as possible. Waste moved from fuel pools must be safeguarded in hardened, on-site storage (HOSS) facilities. Transporting waste to interim away-from-reactor storage should not be done unless the reactor site is unsuitable for a HOSS facility and the move increases the safety and security of the waste. HOSS facilities must not be regarded as a permanent waste solution, and thus should not be constructed deep underground. The waste must be retrievable, and real-time radiation and heat monitoring at

the HOSS facility must be implemented for early detection of radiation releases and overheating. The overall objective of HOSS should be that the amount of releases projected in even severe attacks should be low enough that the storage system would be unattractive as a terrorist target. Design criteria that would correspond to the overall objective must include:

- Resistance to severe attacks, such as a direct hit by high-explosive or deeply penetrating weapons and munitions or a direct hit by a large aircraft loaded with fuel or a small aircraft loaded with fuel and/or explosives, without major releases.
- Placement of individual canisters that makes detection difficult from outside the site boundary.

- **Protect fuel pools:** Irradiated fuel must be kept in pools for several years before it can be stored in a dry facility. The pools must be protected to withstand an attack by air, land, or water from a force at least equal in size and coordination to the 9/11 attacks. The security improvements must be approved by a panel of experts independent of the nuclear industry and the Nuclear Regulatory Commission.

- **Require periodic review of HOSS facilities and fuel pools:** An annual report consisting of the review of each HOSS facility and fuel pool should be prepared with meaningful participation from public stakeholders, regulators, and utility managers at each site. The report must be made publicly available and may include recommendations for actions to be taken.

- **Dedicate funding to local and state governments to independently monitor the sites:** Funding for monitoring the HOSS facilities at each site must be provided to affected local and state governments. The affected public must have the right to fully participate.

- **Prohibit reprocessing:** The reprocessing of irradiated fuel has not solved the nuclear waste problem in any country, and actually exacerbates it by creating numerous additional waste streams that must be managed. In addition to being expensive and polluting, reprocessing also increases nuclear weapons proliferation threats.

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Reducing the Hazards from Stored Spent Power-Reactor Fuel in the United States

Robert Alvarez, Jan Beyea, Klaus Janberg, Jungmin Kang, Ed Lyman, Allison Macfarlane, Gordon Thompson, Frank N. von Hippel

Because of the unavailability of off-site storage for spent power-reactor fuel, the NRC has allowed high-density storage of spent fuel in pools originally designed to hold much smaller inventories. As a result, virtually all U.S. spent-fuel pools have been re-racked to hold spent-fuel assemblies at densities that approach those in reactor cores. In order to prevent the spent fuel from going critical, the fuel assemblies are partitioned off from each other in metal boxes whose walls contain neutron-absorbing boron. It has been known for more than two decades that, in case of a loss of water in the pool, convective air cooling would be relatively ineffective in such a "dense-packed" pool. Spent fuel recently discharged from a reactor could heat up relatively rapidly to temperatures at which the zircaloy fuel cladding could catch fire and the fuel's volatile fission products,

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COMMENTS OF NUCLEAR ENERGY INFORMATION SERVICE TO BRC SUB-COMMITTEE ON TRANSPORTATION AND STORAGE OF HLRW

Presented by
David A. Kraft, Director
November 2, 2010

What specific facility siting attributes and process issues should be considered, if it were determined that one or more interim storage sites were needed until final disposal of waste becomes available?

Before we can responsibly respond to the question put to this panel, we feel it important to establish a framework and context in which the specific question can be analyzed.

I. Role of the BRC:

In some processes macro-process issues must be dealt with before one can credibly deal with the micro-process issues. Before we can comment on the specific question of siting process issues posed above, we must state our perception of the role, mandate and public record to date of the BRC.

While we do not doubt that its members will be hard working, and that some at least will try to reach a credible set of recommendations on high-level radioactive waste (HLRW) isolation based on fact rather than ideology, we retain a healthy level of skepticism in this regard.

From the opening January DOE press release, the BRC cast doubt on its ability to conduct a "comprehensive review," and reach conclusions impartially and in a thorough manner that decades of respected precedent (NEPA, EIS, rate-making dockets, etc.) have set in researching first and then promulgating conclusions and recommendations.

While ostensibly a Commission set up to "conduct a comprehensive review of policies for managing the ***back-end*** of the nuclear fuel cycle," (emphasis ours), it carries the peculiar title of "Blue Ribbon Commission on America's Nuclear Future." – assuming from the start, *a priori*, that the Commission's thorough, impartial investigation would conclude that such a future even existed. The conclusion was already pre-judged, without the benefit of data collection or fact finding. This begs the very serious question: ***is the BRC a study process to know, or a study to show?***

The composition of the BRC is predominantly reflective of the U.S. nuclear power establishment – not truly independent of the self-fulfilling prophecy articulated in the Commission's title. The titles, career paths, and historic written record and actions of the members point strongly to this conclusion. We have been invited to participate in a process that has seemingly pre-judged and eliminated the possibility that the correct conclusion, the conclusion that just might be best for the

nation, is the "none-of-the-above" conclusion – ***stop making the wastes, and you stop making the problem worse.*** This is the "rule of holes" at its fundamental best.

We would also point out though, as a matter of process, that Secretary Chu has explicitly stated in his charge to the BRC in March that while "the focus is definitely on the back end of the fuel cycle," he also said, "I think it's safe to say unless you step back and look at it all, if you just focus on just a tiny portion, we probably will not get to the wisest path."

We and others you have met and will soon meet have consented to share our views and recommendations with the Commission, with the desire that at least these views will become part of the public record and debate on this critical issue, and will illustrate the kind of process that will be necessary moving forward -- in spite of this pre-existing bias and seeming stacked-deck. And in my case – I was born in Chicago. I'm a Cubs fan. I live to be surprised by the world.

II. Principles of waste management

While the Commission Charter is explicit about "managing the back end of the nuclear fuel cycle," Secretary Chu made it abundantly clear several times at the first BRC meeting on March 25th that he was giving flexibility to the BRC to consider "front end" options and how those would affect the back end outputs – namely, the wastes.

Because of this wide latitude explicitly granted by the Secretary, it is incumbent on the BRC to analyze and incorporate into its final recommendations, not only the principles of waste ***management***; but also the principles of waste ***minimization***.

Waste management primarily deals with processes that focus on waste already created. It deals with issues like: re-use, recycling, and waste-to-energy conversions (at least in the realm of solid waste management; a corresponding entity exists for radioactive wastes), and finally, disposal – where possible.

Waste minimization, by contrast, primarily deals with ***prevention*** and ***minimization*** issues. The "best" waste strategies are those not producing waste in the first place, and keeping the rest to a minimum wherever possible. It is thus no accident that, in common terms, the first "R" – reduce – precedes the other two "R's"– re-use and recycle.

In waste hierarchy terms, the most-favored options are prevention and minimization; the least favored options, in descending order would be re-use, recycling, conversion, and disposal methods.

Embracing these fundamental principles of waste, and coupling them with Secretary Chu's decision to throw the net with wide latitude towards the front end of the nuclear cycle, ***no credible process can intentionally exclude thorough examination of scenarios that exclude the prevention and minimization of the production of radioactive wastes*** moving forward, both in terms of existing nuclear facilities, and especially in terms of the new reactors proposed by the so-called "Nuclear Renaissance."

This conclusion – that prevention and minimization must be thoroughly examined as fully viable choices and potential recommendations -- is further validated by the facts that NEPA and EIS proceedings always include examination of scenarios such as : 1.) "do nothing", or, 2.) cost-benefit comparisons between disparate yet alternative technologies (e.g., energy efficiency/conservation considerations vs. new nuclear construction in rate cases at the state level). This is a long

established legal and regulatory precedent, and one which the BRC must incorporate into its deliberations if it wishes its recommendations to be considered thorough, if not credible.

III. Principles for Safeguarding Nuclear Waste at Reactors

In 2002 nearly 90 safe-energy activists, scientists, engineers, lawyer and citizens from dozens of states and First Nations met in Connecticut to hammer out a position of what to do with the U.S.' growing inventory of radioactive wastes. The outcome of that historic gathering was the creation of a document titled, ***"Principles for Safeguarding Nuclear Wastes at Reactors,"*** produced after days of intense debate and many subsequent re-writes. It was ultimately signed by over 150 organizations nationwide. It was updated in 2007, again to be co-signed by over one hundred organizations. To these numbers can be added scores of other groups which felt they could not agree to all the Principles, but agreed with many nonetheless.

NEIS attaches a copy of the updated "Principles" to this submission. It has been forwarded previously to the BRC, and has been posted to the website.

The Principles endorsed by a large proportion of the safe-energy community can be summarized as:

1.) Requiring a low-density, open-frame layout for fuel pools
2.) Establishing hardened on-site storage (HOSS)
3.) Enhancing the protection of existing fuel pools
4.) Requiring periodic review of HOSS facilities and fuel pools
5.) Dedicating funding to local and state governments to independently monitor sites
6.) Prohibiting reprocessing of irradiated fuel

We submit these Principles for consideration for a number of reasons pertinent to the question posed to this Panel:

- It illustrates dramatically a "process issue" that was resolved by public initiative – even though largely ignored by the regulatory and industry establishment
- It demonstrates the public concern for truly solving the issue of HLRW isolation
- It was done in three intense days and nights of hard work (not to mention the advance preparation it required) – without a $10 million dollar budget, support staff, or two years time
- The process was democratic, and largely consensus-based; disagreements remained, but cooperation continues to this day among those disagreeing

We offer this document as a template of "the ***process***" that we urge the BRC to adopt and recommend to Secretary Chu and President Obama. We also offer the ***content*** as a list of what will be ***minimally acceptable*** to the safe-energy community moving forward on ***any*** siting issues, not just those for a hypothetical interim storage facility.

IV. The "hypothetical" exercise of interim radioactive waste storage

Before addressing the hypothetical need and therefore requirements for an interim HLRW storage facility, it was necessary to go into detail in the previous three sections in order to lay out a logical, real-world framework in which to consider such a hypothetical facility.

It was important to establish that:

1. Chairman Chu has given blessings and encouragement to the Commission to fully consider front-end fuel-cycle options that would impact the back-end;
2. The principles of waste management have laid out a clear hierarchy of actions to take, which begin with prevention and minimization, and only then proceed to re-use, recycle and disposal; and finally
3. A real-world model and set of principles for HLRW management has already been developed solely by citizen initiative as early as 2002, and has been largely ignored by the regulatory-industrial complex. That said, it can still be examined on its merits in the present process.

We can now proceed to analyzing the Commission's specific request after one final consideration: under what circumstances or conditions ***would*** an interim storage facility be needed, ***if the principles of waste management were followed?***

In our opinion only two such circumstances would warrant a hypothetical interim storage facility:

1.) extreme emergency, in which an immanent threat to the public health, safety and environment existed or were to exist if no action was taken; and
2.) available waste storage at reactor sites was completely filled, and the nuclear industry needed more room to continue operating the reactors

We can now examine the "specific facility siting attributes and process issues" in relation to these two possible scenarios.

In the first case – dire emergency – it should be noted that:

- the situations would likely be unpredictable and disparate in nature. This would mean that there would be no existing logic for predicting what the appropriate site or appropriate technological response would be, or where it should logically be placed;
- such a situation by definition should call for the closure of the reactors onsite as well, in most if not all cases – a rather extreme way to achieve waste prevention and minimization

Rather than spreading the problem around further, and adding the additional risks associated with HLRW transport to the situation, it would make more sense to establish more rigorous means of dealing with such emergencies onsite, rather than proliferating an additional interim storage site.

In the second case creating such a hypothetical interim waste facility to deal with what is largely a problem of corporate private utility choice is:

- a violation of the previously stated waste principles, in that it would permit the creation of even more of the wastes this Commission is purportedly trying to reduce
- a waste of public (ratepayer) Nuclear Waste funds to benefit a private entity, thus representing yet another hidden subsidy for the nuclear industry
- multiplying, not reducing the number of waste sites to eventually be dealt with
- unnecessarily exacerbating the transportation problems, risks and costs by at least a factor of two, perhaps more

A better choice exists: Hardened On-Site Storage

As to the "specific facility siting attributes and process issues," regardless of whether an interim facility is proposed or not, the way to deal with the HLRW on an interim basis is a technique labeled "HOSS" – hardened on-site storage. (NOTE: a packet of detailed background information describing HOSS will be provided to the BRC at this meeting, and we suspect, in Washington, D.C. at the upcoming full Commission meeting.)

HOSS is a system utilizing currently and future available dry-cask technology, but in a manner providing superior levels of safety and security in a cost effective manner compared to the current use of dry casks by the nuclear industry.

Consistent with the Principles for Safeguarding Nuclear Wastes, HOSS:

- Reduces the density of irradiated fuel stored in fuel pools, and dry-casks onsite;
- Transfers HLRW to dry storage that is hardened to make it more secure and safer, and within earthen barriers to protect the containers;
- Requires the physical testing of all cask designs and inspection of each container prior to utilization; and
- Requires the hardening of fuel pools since all irradiated fuel must be kept in wet storage for the first five years after discharge from the reactor core; finally
- Would increase public and local regulatory participation in waste storage monitoring and decision-making including a commitment to an annual public review process.

The obvious advantages to incorporating the HOSS system over any conceivable interim storage facility option are legion:

- Waste is maintained relatively safely and securely onsite, if NRC and NEI/utility claims are to be believed, and remain under the existing watchful presence of a trained professional regulator and utility staff;
- No transportation is required offsite, eliminating the need to create or expand a costly transportation infrastructure at the present time;
- The sites are already licensed and approved for cry-cask use, completely and permanently avoiding the costs and headaches of undertaking an additional siting process, infrastructure creation, and doubled transportation costs (since the wastes would have to be moved a second time to the permanent repository some time in the future).
- The estimated doubling in cost per dry-cask used is hugely cost effective compared to the costs of the previous two items, and could be paid for from the Nuclear Waste Fund.
- The HOSS system greatly enhances safety and security of both the increasingly hardened spent-fuel pools; and the bermed and dispersed hardened dry-casks, reducing their vulnerability to any credible threat, accident, or natural disaster.

Some historical siting considerations regarding the hypothetical establishment of interim storage facilities.

The safe-energy community opposes the establishment of proposed hypothetical interim storage facilities largely because they are a costly and superfluous diversion to effectively dealing with the HLRW isolation problem. They also are being proposed in the absence of a thorough vetting of a more cost-effective and functional HOSS system, as described above.

It would be worth learning the lessons of some historical precedents which also argue strongly against creation of such unnecessary facilities:

1.) The Illinois Low-Level Radioactive Waste Compact Siting Process, 1985-1991:

In the early 1980s Congress moved to force the states to deal with their growing LLRW problems by ordering the creation of "compacts" – regional agreements between states to share their combined LLRW disposal burdens and costs.

In Illinois in 1985 a hue and cry went up from largely the medical/university/research communities, demanding the immediate creation of a LLRW disposal facility. In one notable instance an op-ed from a prestigious doctor from Loyola Medical Center warned of medical treatments coming to a halt and patients dying in hospital hallways if Illinois did not construct a LLRW disposal dump post haste.

A LLRW facility siting process was instituted, and this writer was among 13 others invited to become a member of the Citizens Advisory Group to help oversee the process and make recommendations. Many in the environmental community advocated source reduction – i.e., waste prevention and minimization – as a preferred and cost effective means to meet the legitimate concerns of all LLRW producers.

After a tumultuous six year, $90 million process, this recommendation was proven correct. The decision was ultimately made to not construct a LLRW disposal facility in Illinois. During those six years, generators got exceptionally good and creative at source reduction, AND were saving money by reducing actual shipped-for-disposal costs. They were also switching in some cases to techniques and processes that were just as good, but which did not require the use of any radiation sources.

The downside was that six years and $90 million were wasted (yes, "waste makes waste!"). And the credibility of the process with the public was shredded with the allegation that the then Director of the Illinois Department of Nuclear Safety (IDNS) had attempted to "fudge" site data to improve one particular site's suitability, an allegation which not only resulted in his resignation in disgrace, but a destruction of the engagement process and hard-won trust between the public sector and the IDNS.

We would be happy to share a more detailed description of some of the positive siting work done and conclusions/recommendations reached during this ill-fated process, in another venue where more time would be available than is provided here today.

Lessons learned (maybe):

- Start with prevention and minimization – i.e., source reduction, before proceeding to waste ratepayer/taxpayer money;
- Don't fudge the data, or as in the case of Yucca Mt., change the standards in the middle of the process if you expect public support for the process and acceptance of the site

2.) Proposed 2006 federal legislation for interim storage of HLRW:

BRC member then-Sen. Pete Domenici championed legislation in 2006 – the Senate version of H.R. 5427, the FY2007 Energy and Water Appropriations legislation -- that called, among other things, for the creation of AFR interim HLRW storage facilities.

While not advocating the creation of HLRW interim storage facilities, we would urge the BRC to consult with former Sen. Domenici about what he proposed in 2006 – and then ***not*** use that as the basis for proceeding.

Sen. Domenici's proposal for interim storage was linked to two other subsequently discredited processes: the opening of the flawed Yucca Mt. facility; and reprocessing of irradiated reactor fuel (largely through the Global Nuclear Energy Partnership –GNEP- program).

Among its many failings, the proposal:

- Placed on an extremely fast-track the eventual identification and license submittal to NRC for interim storage sites (known then as "CAP" sites -- for "Consolidation and Preparation") – less than 11 months from passage of the legislation to licensing submittal to NRC;
- Allowed DOE to designate such CAP sites for a period of 25 years over the objections of state governors and local government;
- Was not submitted in free-standing legislation subject to public debate, but as part of a large appropriations bill.

Predictably, the measure was fought – and eventually defeated. It was opposed in conjointly signed letters by as disparate a list of objectors as: the National Conference of State Legislators: the National Association of Counties; the National League of Cities; the U.S. Conference of Mayors. Governors of states objected including the Coalition of Northeast Governors, and even notorious Illinois' Gov. Rod Blagojevich. A joint letter of concern was also sent to then-Senator Domenici by the two sitting senators from Illinois – Sen. Richard Durbin, and Sen. Barack Obama.

It was reported at the time that DOE itself did not even want or request such overarching pre-emptive authority over the states.

As in the Illinois example above, time has shown the folly of political overzealousness regarding radioactive waste issues. The Yucca Mt. project has since been defunded, dismantled and largely abandoned. The reprocessing component of the GNEP plans of the Bush Administration have been shown to be both uneconomic and highly polluting. Further, no reactors have closed in the absence of the interim HLRW facilities proposed in then-Sen. Domenici's legislation.

Lessons learned (maybe):

- Attempts to create questionable interim HLRW storage facilities by running roughshod over legitimate local jurisdictional concerns and in the absence of a credible public process will be vehemently opposed;
- Attempts to fast-track interim (or any other) HLRW storage facilities by cloaking them in enormous omnibus and appropriations bills doesn't work – and would seem to be a violation of the BRC's mandate to "ensure that decisions in management of used nuclear fuel and nuclear waste are open and transparent, with broad participation."

V. HLRW Transport Issues

While we expect the transport issues will be dealt with more fully in the following Panel today, we do wish to make these points in relation to the proposal for a hypothetical interim storage facility:

1.) Except for the emergency scenario described in Section Iv above -- extreme emergency, in which an immanent threat to the public health, safety and environment existed or were to exist if no action was taken – HLRW should not be transported off reactor sites at this time. The total infrastructure is inadequate to the task.

2.) Despite NRC assurances at a public meeting in Chicago earlier this decade on the Harmonization of International Regulations for Radioactive Waste Transportation, and despite National Academy of Sciences recommendations in 2006, NRC still has not engaged in full-scale actual testing of relevant, contemporary-designed shipping casks. In continues instead to rely on computer modeling – which in our view is necessary, but not sufficient. No shipping should be permitted to continue until full-scale filed testing has been completed.

3.) DOE – and other entities such as the private NEI -- must be forced to cease and desist characterizing those dramatic Sandia Laboratories films of shipping casks being rammed, dropped and burned as testing proof that those shipping casks were "safe". We have the Sandia staff who conducted those simulations on tape saying 1.) those were not tests of cask safety, and 2.) the casks actually did fail two tests, although one failure (the fire simulation) occurred minutes after the arbitrary time limit had expired.

4.) Both dry casks and transport casks need to undergo thorough re-testing to prove they can withstand the assault from today's modern 2010-vintage weaponry. The Sandia films showed that the casks could not withstand hits from 1970s-vintage weapons. One wonders what the effect would be of shipping casks or stationary dry casks being hit by tungsten or depleted uranium munitions – munitions which were able to easily penetrate the 13" frontal composite armor of T-72 tanks during the 2003 Iraq war. And, one is left to wonder – since the NRC has not yet conducted such testing. Transport casks currently have no protection that "robust," to use the regulatory term of the day. Until casks can be proven to be able to withstand such real-life 2010 threats, they have no business being used for transport of HLRW, or at non-HOSSed reactor or interim storage sites.

* * *

We thank the Commission for this opportunity to present out views, and are available to answer questions, provide citations, and other resources as you might need in the future.

Principles for Safeguarding Nuclear Waste at Reactors

The following principles are based on the urgent need to protect the public from the threats posed by the current vulnerable storage of commercial irradiated fuel. The United States does not currently have a national policy for the permanent storage of high-level nuclear waste. The Obama administration has determined that the Yucca Mountain site, which has been mired in bad science and mismanagement, is not an option for geologic storage of nuclear waste. Unfortunately, reprocessing proponents have used this opportunity to promote reprocessing as the solution for managing our nuclear waste. Contrary to their claims, however, reprocessing is extremely expensive, highly polluting, and a proliferation threat, and will actually complicate the management of irradiated fuel. Nor will reprocessing obviate the need for, or "save space" in, a geologic repository.

The United States has a unique opportunity to re-evaluate our nuclear waste management plan. We can make wise decisions about safeguarding radioactive waste or go down the risky, costly, and proliferation prone path towards reprocessing.

The undersigned organizations' support for improving the protection of radioactive waste stored at reactor sites is a matter of security and is in no way an indication that we support nuclear power and the generation of more nuclear waste.

- **Require a low-density, open-frame layout for fuel pools:** Fuel pools were originally designed for temporary storage of a limited number of irradiated fuel assemblies in a low density, open frame configuration. As the amount of waste generated has increased beyond the designed capacity, the pools have been reorganized so that the concentration of fuel in the pools is nearly the same as that in operating reactor cores. If water is lost from a densely packed pool as the result of an attack or an accident, cooling by ambient air would likely be insufficient to prevent a fire, resulting in the release of large quantities of radioactivity to the environment. A low density, open-frame arrangement within fuel pools could allow enough air circulation to keep the fuel from catching fire. In order to achieve and maintain this arrangement within the pools, irradiated fuel must be transferred from the pools to dry storage within five years of being discharged from the reactor.

- **Establish hardened on-site storage (HOSS):** Irradiated fuel must be stored as safely as possible as close to the site of generation as possible. Waste moved from fuel pools must be safeguarded in hardened, on-site storage (HOSS) facilities. Transporting waste to interim away-from-reactor storage should not be done unless the reactor site is unsuitable for a HOSS facility and the move increases the safety and security of the waste. HOSS facilities must not be regarded as a permanent waste solution, and thus should not be constructed deep underground. The waste must be retrievable, and real-time radiation and heat monitoring at

the HOSS facility must be implemented for early detection of radiation releases and overheating. The overall objective of HOSS should be that the amount of releases projected in even severe attacks should be low enough that the storage system would be unattractive as a terrorist target. Design criteria that would correspond to the overall objective must include:

- Resistance to severe attacks, such as a direct hit by high-explosive or deeply penetrating weapons and munitions or a direct hit by a large aircraft loaded with fuel or a small aircraft loaded with fuel and/or explosives, without major releases.
- Placement of individual canisters that makes detection difficult from outside the site boundary.

- **Protect fuel pools:** Irradiated fuel must be kept in pools for several years before it can be stored in a dry facility. The pools must be protected to withstand an attack by air, land, or water from a force at least equal in size and coordination to the 9/11 attacks. The security improvements must be approved by a panel of experts independent of the nuclear industry and the Nuclear Regulatory Commission.

- **Require periodic review of HOSS facilities and fuel pools:** An annual report consisting of the review of each HOSS facility and fuel pool should be prepared with meaningful participation from public stakeholders, regulators, and utility managers at each site. The report must be made publicly available and may include recommendations for actions to be taken.

- **Dedicate funding to local and state governments to independently monitor the sites:** Funding for monitoring the HOSS facilities at each site must be provided to affected local and state governments. The affected public must have the right to fully participate.

- **Prohibit reprocessing:** The reprocessing of irradiated fuel has not solved the nuclear waste problem in any country, and actually exacerbates it by creating numerous additional waste streams that must be managed. In addition to being expensive and polluting, reprocessing also increases nuclear weapons proliferation threats.